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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/630,694	07/31/2003	Tomiji Tanaka	241069US6	7676

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EXAMINER	
LAVARIAS, ARNEL C	
ART UNIT	**PAPER NUMBER**
2872	

DATE MAILED: 07/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/630,694	TANAKA ET AL.
	Examiner	**Art Unit**
	Arnel C. Lavarias	2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5/16/05,4/14/05*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,7-12 and 18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,7-12 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/14/05 has been entered.

Response to Amendment

2. The amendments to Claims 1, 7-10, 12, and 18 in the submission dated 4/14/05 are acknowledged and accepted. In view of these amendments, the objections to the claims in Section 8 of the Office Action dated 1/14/05 are respectfully withdrawn. Further, the rejection of Claim 18 in Section 13 of the Office Action dated 1/14/05 is respectfully withdrawn.

3. The cancellation of Claims 2-6, 13-17 in the submission dated 4/14/05 is acknowledged and accepted.

Response to Arguments

4. The Applicants' arguments filed 4/14/05 have been fully considered but they are not persuasive.

5. The Applicants argue that, with respect to newly amended Claims 1, 12, and 18, the combined teachings of Lewis, King et al., Bloom et al., and Hariharan fail to teach or reasonably suggest the individual control elements having an even number of phase control elements for controlling phase differences among outgoing light from each element so that the zero order diffracted light cancel each other, resulting in zero intensity. The Examiner respectfully disagrees. It is noted that Bloom et al. discloses embodiments of the grating light valve that utilizes both odd (See for example Figure 2 of Bloom et al.) and even (See for example Figure 1(d) of Bloom et al.) number of phase control elements. In addition, the limitation of the control elements 'controlling phase differences among outgoing light from each element so that the zero order diffracted light cancel each other, resulting in zero intensity' is inherent to the operation of the grating light valve (See specifically Figures 3-4; col. 6, lines 18-47; wherein when the phase control elements are adjusted to have a $\lambda/4$ spacing with respect to the substrate surface, destructive interference for the zeroth order diffracted light occurs, such that only the $\pm 1^{st}$ order is produced, as shown in Figure 4.).

6. Claims 1, 7-12, and 18 are now rejected as follows.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1, 7-10, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis (U.S. Patent No. 3677616), of record, in view of King et al. (U.S. Patent No. 6700686), of record, and Bloom et al. (U.S. Patent No. 5311360), of record.

Lewis discloses a holographic recording apparatus and method (See for example Figure 6), the apparatus and method both comprising a laser source emitting laser beams (See 11 in Figure 6); a diffraction control element (See 27, 41 in Figure 6; col. 4, lines 19-42; col. 4, lines 59-64; col. 5, lines 21-32) for receiving a laser beam emitted from the laser source and controlling a diffraction of the received laser beam before letting the laser beam exit; and a diffracted light component blocking element (See 33, 35 in Figure 6; col. 4, lines 16-33) configured to block a predetermined diffracted light component in the diffracted light emitted from the diffraction control element. Lewis additionally discloses the diffraction control element having a plurality of diffraction control elements that control the diffraction of the laser beam independently from each other (See col. 4, lines 19-42; col. 4, lines 59-64; col. 7, lines 9-24); a light dividing element (See 75 in Figure 6) for dividing a laser beam emitted from the laser source into first and second light beams and causing the first light beam to enter the plurality of diffraction control elements; a second condensing element (See 83 in Figure 6) for condensing the second light beam emitted from the light dividing element onto a spot on the hologram recording medium where a laser beam emitted from the condensing element has been condensed; and the diffracted light blocking element blocking all orders of diffracted light except for two diffracted orders of light (i.e. the principle zero order and one other order of light) (See 33, 35 in Figure 6; col. 4, lines 19-58). Lewis lacks one or more first condensing

elements for condensing diffracted light component that has not been blocked by the diffracted light component blocking element onto a hologram recording medium (See 73 in Figure 6), and the control element being a grating light valve such that the individual control elements have even numbers of phase control elements for controlling phase differences among outgoing light from each element so that the zero order diffracted light cancels each other, resulting in zero intensity. However, the use of focusing optics, such as one or more converging or condensing lenses, for focusing incident light down onto a holographic recording medium is well known in the art. For example, King et al. teaches a holographic storage apparatus for recording information into a holographic recording medium (See for example Figures 1-2; Abstract). In particular, object or signal light (See 225 in Figure 2) that has been encoded by a spatial light modulator (See 255 in Figure 1) is focused down to a spot on the holographic recording medium (See 250 in Figure 2) using at least one converging lens (See 280 in Figure 2). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the holographic recording apparatus and method of Lewis further include one or more condensing elements for condensing diffracted light component that has not been blocked by the diffracted light component blocking element onto a hologram recording medium, as taught by King et al., for the purpose of increasing storage capacity by utilizing less space on the holographic recording medium for each recording. The combined teachings of Lewis and King et al. lack the control element being a grating light valve such that the individual control elements have even numbers of phase control elements for controlling phase differences among outgoing light from each element so that the zero order

diffracted light cancels each other, resulting in zero intensity. However, Bloom et al. teaches an alternative optical component, i.e. grating light valve, for use in spatial light modulator applications (See for example Figure 2, 10; Abstract; col. 1, line 17-col. 3, line 7; col. 3, line 31-col. 4, line 42). In particular, Bloom et al. teaches a grating light valve (See for example Figure 9) having individual control elements (See for example 66, 68, 70, 72 in Figure 10) having phase control elements (See for example each individual ribbon 18 in Figure 2) for controlling phase differences among output going light from each element, the output light beams from the control elements being diffracted light beams that have been diffracted by the control elements. Further, the control elements are ribbon shaped (See 18 in Figure 2), and the phase control elements are configured to be driven to the up or down position alternately by an applied electrostatic force (See Figures 3-4; col. 6, lines 18-41). In addition, Bloom et al. discloses embodiments of the grating light valve that utilizes both odd (See for example Figure 2 of Bloom et al.) and even (See for example Figure 1(d) of Bloom et al.) number of phase control elements. It is noted that the limitation of the control elements 'controlling phase differences among outgoing light from each element so that the zero order diffracted light cancel each other, resulting in zero intensity' is inherent to the operation of the grating light valve (See specifically Figures 3-4; col. 6, lines 18-47; wherein when the phase control elements are adjusted to have a $\lambda/4$ spacing with respect to the substrate surface, destructive interference for the zeroth order diffracted light occurs, such that only the $\pm 1^{st}$ order is produced, as shown in Figure 4.). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the control element be

a grating light valve such that the individual control elements have even numbers of phase control elements for controlling phase differences among outgoing light from each element so that the zero order diffracted light cancels each other, resulting in zero intensity, as taught by Bloom et al., in the apparatus and method of Lewis and King et al., for the purpose of providing fast, controlled, and automated adjustments to the phase of the outgoing light, while taking advantage of the high efficiency, high contrast, low cost of manufacturing, and direct integration with electronics of the grating light valve over other existing SLM's.

9. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis in view of King et al. and Bloom et al.

Lewis in view of King et al. and Bloom et al. discloses the invention as set forth above in Claims 1 and 10, except for a light blocking element for blocking the first light beam emitted from the light dividing element; and a light receiving element for receiving light emitted from the hologram recording medium on the basis of the laser beam converged onto the hologram recording medium by the second condensing element. It is noted that the use of shutters or the SLM itself for blocking the object beam during readout or reconstruction of the hologram is well known in the art. Further, it is known in the art to utilize a light receiving element, such as a CCD camera or photodetector array to receive the holographic information that is reconstructed when only the reference beam is incident on the holographic recording medium. See for example Figure 2; 250, 284, 286 in Figure 2; col. 6, lines 20-67 of King et al. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the

holographic recording apparatus and method of Lewis in view of King et al. and Bloom et al. further include a light blocking element for blocking the first light beam emitted from the light dividing element; and a light receiving element for receiving light emitted from the hologram recording medium on the basis of the laser beam converged onto the hologram recording medium by the second condensing element, for the purpose of reducing the number of optical systems, and hence cost, required for recording and reconstructing a hologram (i.e. only a single shared optical system is required, instead of two separate optical systems).

10. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis in view of Bloom et al. and Hariharan (P. Hariharan, 'Optical Holography- Principles, techniques, and applications', Cambridge University Press, Cambridge, 1996, pp. 85, 114-115.), of record.

Lewis discloses a recording medium (See 73 in Figure 6) for recording data by using diffracted light obtained by blocking (See 33, 35 in Figure 6; col. 4, lines 16-33) a predetermined diffracted light component in diffracted light emitted from a diffraction control element (See 27 in Figure 6; col. 4, lines 19-42) that controls the diffraction of a laser beam (See 11 in Figure 6) before letting the laser beam exit. Lewis lacks the diffraction control element having an even number of phase control elements for controlling phase differences among outgoing light from each element so that the zero order diffracted light cancels each other, resulting in zero intensity, and recording data as changes in refraction index of the recording medium. However, Bloom et al. teaches an alternative diffractive control element, i.e. grating light valve, for use in spatial light

modulator applications (See for example Figure 2, 10; Abstract; col. 1, line 17-col. 3, line 7; col. 3, line 31-col. 4, line 42). In particular, Bloom et al. teaches a grating light valve (See for example Figure 9) having individual control elements (See for example 66, 68, 70, 72 in Figure 10) having phase control elements (See for example each individual ribbon 18 in Figure 2) for controlling phase differences among output going light from each element, the output light beams from the control elements being diffracted light beams that have been diffracted by the control elements. Further, the control elements are ribbon shaped (See 18 in Figure 2), and the phase control elements are configured to be driven to the up or down position alternately by an applied electrostatic force (See Figures 3-4; col. 6, lines 18-41). In addition, Bloom et al. discloses embodiments of the grating light valve that utilizes both odd (See for example Figure 2 of Bloom et al.) and even (See for example Figure 1(d) of Bloom et al.) number of phase control elements. It is noted that the limitation of the control elements 'controlling phase differences among outgoing light from each element so that the zero order diffracted light cancel each other, resulting in zero intensity' is inherent to the operation of the grating light valve (See specifically Figures 3-4; col. 6, lines 18-47; wherein when the phase control elements are adjusted to have a $\lambda/4$ spacing with respect to the substrate surface, destructive interference for the zeroth order diffracted light occurs, such that only the $\pm 1^{st}$ order is produced, as shown in Figure 4.). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the diffraction control element have an even number of phase control elements for controlling phase differences among outgoing light from each element so that the zero order diffracted light cancels

each other, resulting in zero intensity, as taught by Bloom et al., in the medium of Lewis, for the purpose of providing fast, controlled, and automated adjustments to the phase of the outgoing light, while taking advantage of the high efficiency, high contrast, low cost of manufacturing, and direct integration with electronics of the grating light valve over other existing SLM's. The combined teachings of Lewis and Bloom et al. lack recording data as changes in refraction index of the recording medium. However, as is known in the art of holography, and as noted by Hariharan, the recordation of a hologram in a holographic recording medium requires that the holographic recording medium be responsive to the incident light with a change in its optical properties, e.g. a change in its absorption coefficient, a change in its refractive index, or a change in its thickness. In the instant case, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the system of Lewis and Bloom et al. record data as changes in refraction index of the recording medium, as is known in the art and further evidenced by Hariharan, to take advantage of the higher diffraction efficiencies provided by refractive index based holograms over amplitude based holograms.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 6822797 to Carlisle et al.

Carlisle et al. is being cited to further evidence the conventional operation of grating light valves (See Figures 1-4), particularly in the instance where the when alternate phase

control elements are adjusted to have a $\lambda/4$ spacing with respect to each other, resulting in destructive interference for the zeroth order diffracted light (See specifically Figures 2, 4; col. 3, line 9-col. 5, line 35).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 9:30 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Arnel C. Lavarias
6/28/05

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